

25-03-2004

WED 15:14 FAX 01832 0000 PATENT DEPARTMENT *** EFO ***

10/516622

005 25.03.2

GB0302091

DT05 Rec'd PCT/PTO 03 DEC 2004

ART 34 AMDT
9882(2)Amended Claims:

1. A method of introducing an oil or gas field production chemical into a subterranean formation comprising:
 - (a) injecting a suspension comprising microparticles suspended in a liquid medium into a formation through an injection well wherein the microparticles have a mean diameter of less than 1 micron and wherein the microparticles comprise an aqueous phase comprising an aqueous solution of a water-soluble oil or gas field production chemical or an aqueous dispersion of water-dispersible oil or gas field production chemical encapsulated in a continuous polymeric phase, and the polymer forming the continuous polymer phase is degradable under the conditions encountered in the formation;
 - 5 (b) allowing the suspension to percolate through the formation towards a production well; and
 - (c) controllably releasing the aqueous solution of the water-soluble oil or gas field production chemical or the aqueous dispersion of the water-dispersible oil or gas field production chemical from the microparticles into the formation and/or the production well through degradation of the polymer forming the continuous polymeric phase.
- 15 2. A method as claimed in Claim 1 wherein the microparticles have a mean diameter in the range 100-750 nm.
3. A method as claimed in Claims 1 or 2 wherein the suspension propagates through the formation at a rate of 15 to 100 feet per day.
- 20 4. A method as claimed in any one of the preceding claims wherein the injection well is 0.25 to 1 mile from the production well.
5. A method as claimed in any one of the preceding claims wherein the suspension is

ART 34 AMDT

injected down the injection well at a temperature of less than 10°C.

6. A method as claimed in any one of the preceding claims wherein the microparticles start to release the aqueous solution or aqueous dispersion of the oil or gas field production chemical at a threshold temperature in the range 50 to 150°C.
- 5 7. A method as claimed in any one of the preceding claims wherein the temperature of the injected suspension increases at a rate of 1 to 10°C per 100 feet in the radial direction from the injection well towards the production well.
8. A method as claimed in any one of the preceding claims wherein the microparticles release substantially all of the aqueous solution or aqueous dispersion of the oil or gas field production chemical in the near wellbore region of the production well.
- 10 9. A method as claimed in any one of the preceding claims wherein the microparticles are dispersed in the liquid medium in an amount of from 20 to 50% by weight.
- 15 10. A method as claimed in any one of the preceding claims wherein the oil or gas field production chemical is dissolved or dispersed in the internal aqueous phase of the microparticles in an amount in the range of from 1 to 50 percent by weight, preferably 5 to 30 percent by weight.
- 20 11. A method as claimed in any one of the preceding claims wherein the oil or gas field production chemical is selected from the group consisting of water-soluble or water-dispersible (i) scale inhibitors, (ii) corrosion inhibitors, (iii) hydrogen sulphide scavengers and (iv) hydrate inhibitors.
12. A method as claimed in any one of the preceding claims wherein the liquid medium of the suspension is selected from the group consisting of an oil, an organic solvent and water.
- 25 13. A method as claimed in claim 12 wherein the liquid medium is a water dispersible organic solvent selected from the group consisting of methyl butyl ether, butyl monoglycol ether and biodegradable esters.
14. A method as claimed in any one of the preceding claims wherein the suspension of microparticles is continuously or intermittently dosed into the injection water.
- 30 15. A method as claimed in Claim 14 wherein the production chemical is a scale inhibitor and the amount of scale inhibitor released into water produced from the

ART 34 AMDT

production well is in the range 1 to 200 ppm.

16. A method as claimed in any one of the preceding claims wherein the microparticles are microcapsules or microspheres.

17. A method as claimed in Claim 16 wherein the microcapsules comprise a well-
5 defined core of the aqueous solution of the water-soluble oil or gas field production chemical or of the aqueous dispersion of the water-dispersible oil or gas field production chemical, and a well-defined wall comprising the degradable polymer.

18. A method as claimed in Claim 16 wherein the microspheres comprise a
10 continuous polymeric matrix comprising the degradable polymer encapsulating the aqueous solution or aqueous dispersion at either a macroscopic or molecular level.

19. A method as claimed in Claim 18 wherein the polymeric matrix is porous or non-porous.

20. A method as claimed in Claims 18 or 19 wherein a plurality of droplets of the aqueous solution or aqueous dispersion are encapsulated in the polymer matrix.

15

20

25

30